

-12-

REMARKS

This communication is in response to the Office Action mailed on November 15, 2005 and response to the telephone interview that occurred on Thursday, January 12, 2006 at 2:00pm est. The examiner is thanked for his time and helpful comments during the interview. In the Office Action, claims 1-44 were pending of which all were rejected.

The Office Action reports that claims 20, 33, and 40 were objected to under 37 C.F.R. 1.75(c) as being of improper dependent form. Claims 20, 33, and 40 have been amended in a manner believed to place the dependent claims in proper form.

The Office Action next reports that claims 1-8, 14, 20, and 34-44 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,828,991 to Skeina et al. (hereinafter Skeina) in view of U.S. Patent No. 5,953,541 to King et al. (hereinafter King)

Claim 1 has been amended to recite a method for determining a word entered using a reduced keypad, where each of one or more keys of the reduced keypad is mapped to a plurality of letters, the method comprising: receiving key input corresponding to the entered word and at least one of a left context and a right context; determining a list of possible words corresponding to the key input for the entered word, wherein each listed word is in a vocabulary or previously entered into a cache; using a language model comprising probability values corresponding to sequences of word N-grams of a natural language to rank the listed words based on at least one of the left context and the right context of the key input; and updating the language model with additional training using words entered into the cache. [emphasis added]

The amendments to claim 1 clarify that each word on the list of possible words that correspond with the key input is in a vocabulary or vocabulary list or has been previously entered into

-13-

the cache, typically by a user. As discussed in the interview, the amendment further clarifies that the language model includes probability values that correspond with sequences of word N-grams of a natural language. Further, the amendments to claim 1 clarify that the language model used to rank the list of possible words is updated using words previously entered into the cache. Thus, as discussed in the interview, the language model of the present inventions can be initially trained based on a large, fixed training corpus but later updated based on words previously entered into the cache. It is noted that both words previously entered into a cache and their respective occurrences could be used to update the language model.

As discussed in the interview, it is believed that updating the language model using words previously entered into the cache is advantageous over a language model constructed using a fixed corpus that is not updated based on words entered into a cache because individual users can have propensities to use certain words more or less frequently than is typical. Also, users can be engaged in particular fields of endeavor such as engineering or sports. In these fields of endeavor, users typically use certain words more or less frequently than may occur in a fixed training corpus of a particular natural language. Thus, as discussed in the interview, it is believed that updating the language model using words previously entered into a cache as recited in claim 1 can result in a language model having increased accuracy such as for particular users or for particular fields of endeavor.

Skiena discloses a system and method of reconstructing sentences entered using a reduced keyboard such as a telephone keypad using word ambiguity resolution. However, it is believed that Skiena does not teach or suggest all of the features of claim 1. For example, it is believed that Skiena does not include updating a language model using words previously entered into a

-14-

cache as recited in claim 1. Instead, as emphasized in the interview it is believed that Skiena's word and word pair frequencies are determined using a large, fixed corpus (abstract) rather than a language model that is updated based on words entered into a cache. For example, Skiena disclose the "Brown" corpus as one possible corpus. (Col. 6, lines 46-49)

The Office Action states that Skiena does not specifically suggest the ability to train language data based on words entered into a cache. However, the Office Action contends that King teaches such a language data training method at Col. 16, lines 44-56 and Col. 26, lines 5-49. It is respectfully observed that if Skiena or other prior art do not suggest training a language model based on words previously entered into a cache, then it would not be obvious to modify Skiena with such a feature. For illustration, the MPEP provides in part,

Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. [MPEP 2143.01]

It is believed that the Office Action does not point out such a teaching, suggestion, or motivation to combine Steina and King as proposed. Thus, the applicants respectfully request withdrawal of the above obviousness rejection.

Further, as discussed in the previous amendment, it is believed that the Skiena system and method requires that the entire sentence be entered first with symbols placed between words in order segment individual words. (See FIGS. 3 and 7) A word trellis or lattice is apparently constructed with possible words or tokens corresponding to each entered word. (abstract) Paths through the lattice represent possible sentence re-

-15-

constructions. (abstract) A Viterbi algorithm is used to decode or select paths based on probability. (Col. 9, lines 9-11)

Importantly, as discussed in the interview, it is believed that Skiena discloses that implausible sentences be rejected by labeling each possible word with a tag representing a grammatical word category or part of speech, such as noun or verb. (FIG. 8, Col. 9, line 64 to Col. 10, line 2) It is believed that bigram frequencies for these grammatical tags are used to calculate transitional probabilities. These transitional probabilities are considered by the Viterbi algorithm in determining probable paths through the lattice based on constructing grammatically plausible word sequences. (Col. 10, lines 12-19)

The Office Action refers to Col. 11, lines 30-47 to contend that Skiena discloses using a language model to rank the listed words based on one or more of the at least one of the left context and the right context of the key input. However, the referred to section states:

[A] stored language rule set representative of usage in the selected language [is utilized] to derive probability values for sequencing of individual word choices for such word position relative to at least one word choice for an adjacent word position in the sentence structure, the language rule set including rules in one of the following categories (i) rules based on transitional probability of use of particular word sequences, and (ii) rules based on probability of relative positioning of words of particular word categories in a sentence structure [Col. 11, lines 32-40]

Thus, it is believed that the probabilities values of Skiena are based on grammatical sequences such as <noun> <verb> and not probability values corresponding to sequences of words such as "I am" or "he is" that are found in a natural language such as English.

-16-

Further, the Office Action refers to secondary reference King to contend that King teaches a language data training method based on words entered into a cache. King discloses a system for disambiguating ambiguous input sequences by displaying objects associated with the generated input sequences in the order of decreasing frequency of use. In particular, the Office Action points to Col. 16, lines 44-56 and Col. 26, lines 5-49 as disclosing the above language data training method feature.

Claim 1, as amended, recites updating the language model with additional training using words entered into the cache. It is believed that King does not include updating the language model using words entered into a cache as recited in claim 1. Instead, it is believed that King creates a custom vocabulary from words previously entered but does not use such words for updating the language model with additional training as recited in claim 1.

During the interview, the examiner suggested the language model feature be further limited to N-gram sequences of words to further clarify over the cited art. The examiner and the applicant's representative discussed a few possible ways to use the term "N-gram" in the language model feature. In the present amendment, claim 1 recites "using a language model comprising probability values corresponding to sequences of word N-grams of a natural language..." [emphasis added] It is believed that the above recitation of "N-gram" conforms to the suggestion of the examiner made during the interview.

In light of the foregoing, it is believed that claim 1 is patentable over the cited art. Claims 2-20 depend on claim 1 and are believed to be separately patentable. Reconsideration and allowance of claims 1-20 are respectfully requested.

Claim 21 has been amended in a manner similar to claim 1. Remarks relating to claim 1 are herein incorporated by

-17-

reference. Thus, claim 21 is believed to be patentable over the cited art. Claims 22-26 depend on claim 1 and are believed to be separately patentable. Reconsideration and allowance of claims 21-26 are respectfully requested.

Further, claim 27 has been amended similar to claim 1. Therefore, the above remarks relating to claim 1 are incorporated herein. Further, claim 27 also include smoothing and pruning the language model, which is important in addressing inaccuracies associated with sparse data. In light of the foregoing, it is believed that claim 27 is patentable over the cited art. Claims 28-33 depend on claim 27 and are believed to be separately patentable. Reconsideration and allowance of claims 27-33 are respectfully requested.

Finally, claim 34 has also been amended in a manner similar to claim 1 but further clarifies that a user enters words into a cache. Remarks relating to claim 1 are incorporated herein. Thus, in light of the foregoing, it is believed that claim 34 is patentable over the cited art. Claims 35-44 depend on claim 34 and are believed to be separately patentable. Reconsideration and allowance of claims 34-44 are respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

WESTMAN, CHAMPLIN & KELLY, P.A.

By: 

Linda P. Ji, Reg. No. 49,027
Suite 1600 - International Centre
900 Second Avenue South
Minneapolis, Minnesota 55402-3319
Phone: (612) 334-3222 Fax: (612) 334-3312

LPJ:rdg